REMARKS

Claims 2, 3, 10 and 16 stand rejected under 35 USC 112, second paragraph, as being indefinite. Claims 1-20 have been replaced with new claims 21-48 and it is believed that the new claims are not open to rejection under 35 USC 112, second paragraph.

Claims 1-20 stand rejected under 35 USC 103 over the admitted prior art in view of any one of Arbiter et al, Kuhn et al, or Csendes.

The subject matter of this application, as defined in the new claim 21, is a method for separating valuable minerals from an ore comprising grinding the ore, forming a slurry from the ground ore, measuring an electrochemical potential of the slurry, and separating valuable minerals from the slurry by flotation, precipitation and filtering.

As set forth in claim 21, the grinding, flotation, precipitation and filtering are carried out under an essentially closed recirculating gas atmosphere, and the composition of the recirculating gas atmosphere is controlled depending on the measured electrochemical potential.

Claim 21 is supported by the original claims 1 and 14-17 and, at least, the paragraph starting at page 3, line 5 of the specification.

Claim 23 specifies that the oxygen content of the recirculating gas atmosphere is increased by adding air, oxygen or oxygen-enriched gas to the recirculating gas atmosphere. Claim 23 is supported by the sentence starting at page 2, line 31 of the specification.

The examiner relies on the admitted prior art as disclosing that it is known to treat a mineral-laden slurry by grinding, flotation, separating, etc. and further that it is known that control of oxygen within the process has been a problem resulting in undesirable end products. Applicant wishes to clarify for the record the scope and content of the prior art as set forth in the specification, namely that overoxidation of minerals results in nonselectivity and weakened recovery, as well as in increased chemical expenses (page 1, lines 18-19)

and that a reason for unsatisfactory operation of sub-processes following flotation is lack of control of the oxidation-reduction conditions in the slurry under treatment (page 1, lines 27-29). The admitted prior art does not state broadly that the control of oxygen within the process has been a problem resulting in undesirable end products.

The examiner relies on each of Arbiter et al, Kuhn et al, and Csendes as disclosing a solution to the problem (of control of oxygen) by disclosing a similar process including the step of recirculating oxygen-bearing gas to provide for strict oxygen control within the process.

Arbiter et al discloses a multi-stage leaching process in which oxygen-bearing gas is drawn from the atmosphere above a body of slurry and is discharged into the slurry at or near the bottom of the leaching vessel in an amount sufficient to maintain an oxygen partial pressure of at least several psi in the vessel. See columns 3 and 4 of Arbiter et al. The purpose of supplying the oxygen-bearing gas is evidently to meet the needs of the leaching reactions. Thus, the oxygen supplied to the reaction vessel, accompanied by ammonia, reacts with zinc sulfide and copper sulfide to produce soluble ammoniacal compounds.

Kuhn et al discloses a process for recovery of lead, zinc and iron sulfide. Zinc is first leached from bulk concentrate in a closed circuit and the leaching residue is fed to a flotation step. Applicant submits that Kuhn does not disclose or suggest the step of recirculating oxygen-bearing gas in a process similar to that set forth in claim 21. As in the case of Arbiter et al, the oxygen-bearing gas is supplied to a leaching step as needed for the leaching reaction. The process disclosed by Kuhn et al is generally similar to that disclosed by Arbiter et al. It appears that in fact the process disclosed by Arbiter et al is a development of the process disclosed by Kuhn et al, in that several paragraphs in the summary of the invention of Arbiter et al appear identical to paragraphs in the description of the invention of Kuhn et al.

Csendes discloses a grinding unit 10 including a chamber to which solid material is fed and into which a gas, such as air, is fed from the bottom at an inlet 15. Fine particles

are fed from an upper zone 13 through a line 17 to a cyclone 20 for isolation of the fine product. Air from the cyclone is recycled to the lower zone 11 of the grinding unit 10. As described in Csendes, grinding is effected in a fluidized bed that is formed in the chamber. The examiner has not drawn attention to any wording in Csendes suggesting that oxygen in the air reacts with the particles in the grinding unit, such that it might be desirable to control the oxygen content of the recycling air. On the contrary, the sentence starting at column 9, line 56 suggests that the gaseous atmosphere in the grinding unit is non-reactive with the feed material.

Further, claim 21 specifies that the composition of the recirculating gas atmosphere is controlled depending on the measured electrochemical potential of the slurry. Neither the prior art discussed on pages 1 and 2 of the specification nor the references cited by the examiner suggests measuring an electrochemical potential of a slurry and carrying out grinding, flotation, precipitation and filtering under an essentially closed recirculating gas atmosphere of which the composition depends on the measured electrochemical potential.

In view of the foregoing, applicant submits that the secondary references relied upon by the examiner do not supply the deficiency in the admitted prior art. The subject matter of claim 21 is not disclosed or suggested by the admitted prior art and the cited references, whether taken singly or in combination. Therefore, claim 21 is patentable and it follows that the dependent claims 22-30 also are patentable.

Claim 31 differs from claim 21 by reciting that the composition of the recirculating gas atmosphere depends on the measured content of oxygen in the recirculating gas atmosphere, instead of on the basis of the measured electrochemical potential of the slurry. Claim 31 is supported by the paragraph starting at page 3, line 5 in conjunction with the sentence starting at page 3, line 16 of the specification. Except to the extent that it refers to the electrochemical potential of the slurry, the discussion above in support of claim 21 is applicable to claim 31 also.

Neither the prior art discussed on pages 1 and 2 of the specification nor the references cited by the examiner refers to the oxygen of the gas being measured and the measured value serving as a basis for controlling the composition of the gas. Applicant therefore submits that the subject matter of claim 31 is patentable and it follows that the dependent claims 32-39 also are patentable.

The subject matter of claim 40 is a method for separating valuable minerals from an ore. The method comprises grinding the ore under an essentially closed recirculating gas atmosphere containing an oxidizing gas and having a partial pressure of oxygen lower than atmospheric air, and forming a slurry from the ground ore. The method further comprises separating valuable minerals from the slurry by flotation under an essentially closed recirculating gas atmosphere containing an oxidizing gas and having a partial pressure of oxygen lower than atmospheric air. Claim 40 is supported by at least the example described on page 6 of the specification. Based on the foregoing discussion of the prior art mentioned on pages 1 and 2 of the specification and the references cited by the examiner, applicant submits that the subject matter of claim 40 is not disclosed or suggested by the admitted prior art and the cited references, whether taken singly or in combination. Therefore, claim 40 is patentable and it follows that the dependent claims also are patentable.

Respectfully submitted,

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